CIVIL-TECH CONSULTANTS AND ENGINEERS

Building & Highway Material Testing Laboratory

NABL - Accredited Laboratory as per ISO / IEC-17025 : 2005

Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC(QB)/2014-15 09.06.2014

TEST REPORT

CLIENT	:	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
AGENCY	:	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
NAME OF THE WORK	:	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
REFERENCE	:	EE/BTP/BBMP/KRIDL/WO/ /2013-14
SAMPLE ID	:	Bitumen
DATE OF TESTING		09.06.2014

The results of the tests conducted on the bitumen sample

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2006
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	68.0	60 to 70
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	59.0	Min. 45
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	> 100	Min. 50
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	260 ^{0}C	Min. 220
5	Fire Point, ^{0}C	IS :1209 -1978 (RA-2009)	300 ^{0}C	-

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ಬ್ಯಾಟರಾಯನಪುರ ಉಪ ವಿಭಾಗ

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
ಬ್ಯಾಟರಾಯನಪುರ ಉಪ ವಿಭಾಗ
ಬಿಬಿಎಂಪಿ, ಬೆಂಗಳೂರು-24

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC(QB)/2014-15 10.06.2014

TEST REPORT

CLIENT	:	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
AGENCY	:	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
NAME OF THE WORK	:	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
REFERENCE	:	EE/BTP/BBMP/KRIDL/WO/ /2013-14
SAMPLE ID	:	Bitumen
DATE OF TESTING		10.06.2014

The results of the tests conducted on the bitumen sample

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2006
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	65.0	60 to 70
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	57.0	Min. 45
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	> 100	Min. 50
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	270 ^{0}C	Min. 220
5	Fire Point, ^{0}C	IS :1209 -1978 (RA-2009)	310 ^{0}C	-

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/AIV/2014-15 09.06.2014

Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Source / Location	Hot Mix Plant, Mysore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	09.06.2014

Sl No.	Details	Trial No. 1	Trial No. 2	Trial No. 3	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	378	381	383	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	77	80	84	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	301	299	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	20.37	21.00	21.93	21.10

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Source / Location	Hot Mix Plant, Mysore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	09.06.2014

Sl No.	Details	Trial No. 1	Trial No. 2	Trial No. 3	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	378	381	383	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	83	84	86	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	295	297	297	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	21.96	22.05	22.45	22.15

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Source / Location	Hot Mix Plant, Mysore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	09.06.2014

Sl No.	Details	Trial No. 1	Trial No. 2	Trial No. 3	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	379	382	384	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	85	88	91	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	294	294	293	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	22.43	23.04	23.70	23.05

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/AIV/2014-15 10.06.2014

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Technical Reference	IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	10.06.2014

Result : Flakiness Index = **12.41%**

Elongation Index = **13.26%**

Result : Combined Flakiness & Elongation index **25.67%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/AIV/2014-15 10.06.2014

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Technical Reference	IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	10.06.2014

Result : Flakiness Index = **12.38%**

Elongation Index = **13.15%**

Result : Combined Flakiness & Elongation index **25.53%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/AIV/2014-15 10.06.2014

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Technical Reference	IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	10.06.2014

Result : Flakiness Index = **12.16%**

Elongation Index = **13.45%**

Result : Combined Flakiness & Elongation index **25.61%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/Stripping/2014-15 12.06.2014

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	12.06.2014

Type of binder : 60/70
Percentage of binder used : 5.0% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.0 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.2	3.43	96.57
2	3.4		
3	3.7		

Comments:

→ Minimum allowable Aggregate retained coating for Semi Dense Bituminous Concrete is 95%

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/Sp_Wa/2014-15 13.06.2014

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Type of Mix	Semi Dense Bituminous Concrete
Source / Location	Hotmix Plant, Mysore
Date of Testing	13.06.2014

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	1997	2011	2013	
2	Weight of basket suspended in water	W_2 g	755	755	755	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1242	1256	1258	
4	Weight of saturated surface dry aggregate in air	W_3 g	2008	2021	2019	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	766	765	761	
6	Weight of oven dried aggregate	W_4 g	1991	2006	2003	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.599	2.622	2.632	2.618
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.658	2.675	2.689	2.674
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.85%	0.75%	0.80%	0.80%

Comments:

→ Maximum allowable Aggregate Water absorption value for Semi Dense Bituminous Concrete is 2.0%

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/Bitumen/2014-15 12.06.2014

BITUMEN CONTENT DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AASHTO T 164

CLIENT	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
NAME OF THE WORK	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/KRIDL/WO/ /2013-14
SAMPLE I/D	Roads in Mariyannapalya, Ward No. 06
DATE OF TESTING	12.06.2014

BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	475.5	476
3. Weight of Asphalt and Mineral matter Extracted, g	-	-
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	24.5	24.00
7. Bitumen content in %	4.90	4.80
8. Average	4.85	

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BITUMEN GRADATION DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AASHTO T 30

CLIENT	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
NAME OF THE WORK	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/KRIDL/WO/ /2013-14
SAMPLE I/D	Roads in Mariyannapalya, Ward No. 06
DATE OF TESTING	12.06.2014

GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-4 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	26.53	5.58	5.58	94.42	90-100
4.75	252.24	53.05	58.63	41.37	35-51
2.36	78.49	16.51	75.13	24.87	24-39
1.18	33.51	7.05	82.18	17.82	15-30
0.3	22.63	4.76	86.94	13.06	9-19
0.075	32.48	6.83	93.77	6.23	3-8

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-4 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	36.45	7.66	7.66	92.34	90-100
4.75	249.56	52.43	60.09	39.91	35-51
2.36	52.84	11.10	71.19	28.81	24-39
1.18	50.32	10.57	81.76	18.24	15-30
0.3	20.98	4.41	86.17	13.83	9-19
0.075	42.18	8.86	95.03	4.97	3-8

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Building & Highway Material Testing Laboratory

NABL - Accredited Laboratory as per ISO / IEC-17025 : 2005

Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/Bitumen/2014-15 13.06.2014

BITUMEN CONTENT DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AASHTO T 164

CLIENT	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
NAME OF THE WORK	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/KRIDL/WO/ /2013-14
SAMPLE I/D	Roads in Mariyannapalya, Ward No. 06
DATE OF TESTING	13.06.2014

BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	476.5	476
3. Weight of Asphalt and Mineral matter Extracted, g	-	-
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	23.5	24.00
7. Bitumen content in %	4.70	4.80
8. Average	4.75	

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/Gradation/2014-15 13.06.2014

BITUMEN GRADATION DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AASHTO T 30

CLIENT	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
AGENCY	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
NAME OF THE WORK	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
REFERENCE	EE/BTP/BBMP/KRIDL/WO/ /2013-14
SAMPLE I/D	Roads in Mariyannapalya, Ward No. 06
DATE OF TESTING	13.06.2014

GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-4 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	26.85	5.63	5.63	94.37	90-100
4.75	263.47	55.29	60.93	39.07	35-51
2.36	63.29	13.28	74.21	25.79	24-39
1.18	45.82	9.62	83.83	16.17	15-30
0.3	22.19	4.66	88.48	11.52	9-19
0.075	31.27	6.56	95.05	4.95	3-8

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-4 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	27.95	5.87	5.87	94.13	90-100
4.75	268.45	56.40	62.27	37.73	35-51
2.36	48.63	10.22	72.49	27.51	24-39
1.18	37.98	7.98	80.46	19.54	15-30
0.3	28.53	5.99	86.46	13.54	9-19
0.075	34.15	7.17	93.63	6.37	3-8

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/AGG/2014-15 12.06.2014

Aggregate Gradation Test

IS : 2386 Part I

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Sample I / D	Hot Mix Plant, Mysore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	12.06.2014

Total Weight of Sample: 5475 gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	394	7.2	7.20	92.80	90-100	
4.75	2836	51.8	59.00	41.00	35-51	
2.36	661	12.1	71.07	28.93	24-39	
1.18	443	8.1	79.16	20.84	15-30	
0.3	489	8.9	88.09	11.91	9-19	
0.075	347	6.3	94.43	5.57	3-8	

Total Weight of Sample: 5175 gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	362	7.0	7.00	93.00	90-100	
4.75	2512	48.5	55.54	44.46	35-51	
2.36	706	13.6	69.18	30.82	24-39	
1.18	513	9.9	79.09	20.91	15-30	
0.3	469	9.1	88.15	11.85	9-19	
0.075	363	7.0	95.17	4.83	3-8	

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Job No.: CTCE/BBMP/WNo.06/KRIDL/SDBC/AGG/2014-15 13.06.2014

Aggregate Gradation Test

IS : 2386 Part I

Client	**Asst. Executive Engineer,** Byatarayanapura Sub Division, BBMP, Bangalore.
Agency	**Technical Manager (West),** KRIDL, BBMP, Bangalore.
Name of the Work	Improvements to roads and drains at Mariyannapalya Left Side in Ward No. 06, Dasarahalli Village Limits, BBMP, Bangalore.
Reference	EE/BTP/BBMP/KRIDL/WO/ /2013-14
Sample I / D	Hot Mix Plant, Mysore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	13.06.2014

Total Weight of Sample: 5675 gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	395	7.0	6.96	93.04	90-100	
4.75	2791	49.2	56.14	43.86	35-51	
2.36	820	14.4	70.59	29.41	24-39	
1.18	456	8.0	78.63	21.37	15-30	
0.3	473	8.3	86.96	13.04	9-19	
0.075	495	8.7	95.68	4.32	3-8	

Total Weight of Sample: 6250 gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	453	7.2	7.25	92.75	90-100	
4.75	2944	47.1	54.35	45.65	35-51	
2.36	710	11.4	65.71	34.29	24-39	
1.18	549	8.8	74.50	25.50	15-30	
0.3	524	8.4	82.88	17.12	9-19	
0.075	682	10.9	93.79	6.21	3-8	

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